

METHOD AND APPARATUS FOR BOUNDING THE SOLUTION SET OF A SYSTEM OF LINEAR EQUATIONS

ABSTRACT

One embodiment of the present invention provides a system that bounds the solution set of a system of nonlinear equations specified by the set of linear equations $\mathbf{Ax} = \mathbf{b}$, wherein \mathbf{A} is an interval matrix and \mathbf{b} is an interval vector. During operation, the system preconditions the set of linear equations $\mathbf{Ax} = \mathbf{b}$ by multiplying through by a matrix \mathbf{B} to produce a preconditioned set of linear equations $\mathbf{M}_0\mathbf{x} = \mathbf{r}$, wherein $\mathbf{M}_0 = \mathbf{BA}$ and $\mathbf{r} = \mathbf{Bb}$. Next, the system widens the matrix \mathbf{M}_0 to produce a widened matrix, \mathbf{M} , wherein the midpoints of the elements of \mathbf{M} form the identity matrix. Finally, the system uses \mathbf{M} and \mathbf{r} to compute the hull \mathbf{h} of the system $\mathbf{Mx} = \mathbf{r}$, which bounds the solution set of the system $\mathbf{M}_0\mathbf{x} = \mathbf{r}$.